OF
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A GROUND-WATER SUPPLY AT KAKE, ALASKA

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This report gives results of a drilling project carried out by the Alaska Public Works and the Alaska Department of Health. The Ground-Water Branch, U. S. Geological Survey was asked to cooperate in the investigation as part of its overall program of appraising the ground-water resources of Alaska. The program is under the general supervision of [illegible], Chief of the Ground-Water Branch.

Kake is a small Indian village located in southeast Alaska, about 100 miles south of Juneau, on Kupreanof Island. The island is approximately 30 miles wide and 45 miles long. The village is near the northwest end of the island and fronts on Keku Strait to the southwest.

The Alaska Department of Health drilled the well at Kake to determine whether ground water was available in sufficient quantity and of good quality for public use. No previous subsurface exploration had been done in the area.

The village extends along a narrow bench that is about 20 feet above sea level. The land surface rises immediately behind (northeast) the village to a broad, relatively flat area about 100 feet above the village. A small stream, which is the source of the present water supply of the village, bisects the flat area and empties into Kake

the village

Klawak just north of Naha. The only road in the area extends southwest of the village, along the beach, to a cannery. Except for the pond and the village area, the land is covered with a dense, almost impenetrable forest. not impassable

The rocks exposed at Naha consist of a thin surficial layer of marine sediments (frequent zones of shell fragments are commonly exposed in foundation excavations on the beach) overlying consolidated rock. The consolidated rock crops out along the shore and along the hill behind the village. The rocks of the generalized are classified (Buddington, A. F., and Chapin, Theodore, 1929, Geology and mineral deposits of southeastern Alaska: U. S. Geol. Survey Bull. 800, p. 106) as consisting of "andesitic volcanics, including breccia with a limestone matrix and lava flows locally interbedded with sediments." Cederstrom (Cederstrom, D. J., 1950, Summary of groundwater development in Alaska, 1950: U. S. Geol. Survey Circ. 108, p. 10) states that the rocks exposed along the beach at Naha are largely crystalline limestone," and the underlying rocks are "predominantly greywacke and associated tuffs." The beds were observed to dip about 25° to the northeast.

The present water supply for the village is derived from springs and a small, dammed-up stream. This supply is dependent upon the heavy precipitation that is characteristic of southeast Alaska. No precipitation records are kept at Naha, but Sitka and Petersburg, which lie 50 miles west and east, respectively, each have about 100 inches per year.

A cable-tool drilling rig was barged into Lake and a drilling site selected. The site chosen was within the village to eliminate the expense of clearing a trail into the forest to a more favorable site. The cost of a pipeline from and a power line to the well, if the well were successful, were also major considerations in locating the site.

The well site (about 30 feet above sea level) is slightly up the slope of the hill at the north end of the village. The shore line (strand line) is about 180 feet from the site and about 25 feet below it. Much difficulty was encountered in starting the drill hole because large, flat-faced rocks caused the hole to veer from the perpendicular. The surface casing had to be restarted and the hole blasted out many times to insure a reasonably straight hole. Many sticks of dynamite were used to help start the hole and to maintain it plumb throughout the drilling. An 8-inch hole was attempted at first but because of the above difficulties the driller was unable to make up a long string of heavy tools. Hence, the driller advised reducing the diameter of the hole to 6 inches, thus enabling him to string a longer and heavier drill stem. Consequently, the heavier string of tools permitted easier drilling and progress and the hole was resumed. The hole was cased to 74.2 feet and the casing later cemented in.

The driller's log (page 2) indicates that fractures were encountered from 38 to 54 feet and from 68 to 88 feet. Water was

entered the well into the well through these fractures in increasing volume as each fracture was encountered. At 90 feet a 24-hour pumping test of 24 hours duration indicated a yield of 15 gallons per minute with about 77 feet of drawdown. The static water level is about 6½ feet below the land surface, nearly 2½ feet above sea level. It was decided to complete the well at the 90-foot depth because the bottom of the well was then about 60 feet below sea level and it was desired not to go any deeper below sea level than necessary. The danger of intersecting a fracture that extended outward into salt water was considered possible. The quantity of water obtained appeared to be sufficient for the demands of the new school and the proposed Health Center.

The water was analyzed and found to be moderately hard (see page 5), but to be otherwise of good quality. The chloride content is low, but the well should be judiciously pumped to prevent sustained overdraft and possible salt water encroachment.

ALASKA DEPARTMENT OF HEALTH

Log on well No. 2 at Kake, Alaska. Date Sept. 8th, 1956. Driller Geo. H. Ramsey

Driller's Helper Glenn H. Ramsey. Water level 8 feet from top of casing. Casing 1'4" feet above ground.

FINAL WELL LOG

		Depth of Formation
From 0 feet to 2 feet	Top Soil	2
From 2 feet to 6 feet	Rock	4
From 6 feet to 8 feet	Rock	2
From 8 feet to 38 feet	Rock. Fractures laying on 20 degrees.	30
From 38 feet to 54 feet	Rock. Fractures. Crevices.	16
From 54 feet to 68 feet	Rock	14
From 68 feet to 83 feet	Rock. Crevices	15
From 83 feet to 88 feet	Rock. Crevices	5
From ___ feet to ___ feet		

With 6 inch casing. 14'2" feet of casing in ground. Casing 1'4" feet above ground. Well finished at 90 feet with no inches no feet of no slot screen. Output of well 15 G.P.M. with 77 feet drawdown.

Remarks: Had to shoot well every 5 ft to keep hole straight from 10' to 38'

Well started to make water at 36' to 88'

Run a 24 hr pump test. Water cleared up in 18 hrs.

NO SALT WATER. Water very good tasting.

CHEMICAL ANALYSIS OF WELL WATER AT KAKE

U. S. Geological Survey

Analyzed by ~~Quality of Water Branch,~~ Palmer, Alaska

Chemical

CONSTITUENTS IN PARTS PER MILLION (ppm)

P 10/9/56 P

	Dates Collected	
	9-6-56 on completion of drilling	109 near end of 24-hour pumping test
SiO_2	11	11
Fe	~~0~~.00	~~0~~.00
Ca	37	37
Mg	5.7	6.8
Na	6.2	8.3
K	2.1	1.8
CO_3	0	0
HCO_3	144	150
SO_4	4.8	7.0
Cl	4.0	4.0
F	~~0~~.0	-
NO_3	~~0~~.2	~~0~~.2
Mn	-	~~0~~.45
Sum	130	142
pH	8.1	8.1
Hardness as $CaCO_3$	120	116
Specific Conductance at 25° C (Micromhos)	263	248